



**The ABAG  
Local Government  
Energy Partnership  
presents:**

## **Energy Smart HVAC Replacement**

# **Trouble deciding when to repair or replace?**

Local governments are often faced with the decision whether to repair an older air conditioning unit or replace it with a newer, higher efficiency system. Most light-commercial HVAC products are designed for a life expectancy of 15 to 20 years. However, even before the equipment reaches the end of its useful life, performance degrades, repair costs increase, and newer more energy-efficient models become available. You can reduce energy and operating costs by developing a systematic program for deciding which equipment should be replaced each year.

In Northern California, replacing HVAC units that are over 20 years old now rather than waiting until the equipment fails is often cost-effective. This is particularly true if the unit is in poor condition and does not have a functioning economizer. The insert to this fact sheet shows the lifecycle benefit of replacing a 15-ton rooftop package unit of varying ages for a typical California office building.

This fact sheet recommends an approach to setting up a replacement program for packaged unitary heating and cooling equipment units and split-systems. These steps can be implemented by in-house staff or a maintenance contractor.

## STEP ONE

### Create an Equipment Inventory

The first step in establishing an HVAC replacement program is to create an inventory of your HVAC equipment. This is usually done through a combination of site surveys, records of the original installation (such as as-built drawings), and maintenance records. This inventory should include the following: equipment description, location, area serviced make/model, serial number, size, and year installed (obtained from the manufacturer based on the serial number). It is important to note whether the unit is equipped with an outside air economizer.

## STEP TWO

### Compile Maintenance Records

Next, compile maintenance records for each piece of equipment, including repair history, warranty information, and factory or contractor-backed service agreements. Then assess the maintenance records and determine the following for each piece of equipment.

- Is preventive maintenance being performed?  
By whom and how frequently?
- Has the equipment been overhauled?  
If so, when?
- Is the equipment under a warranty or service-agreement? For how much longer?
- Have there been a lot of complaints from occupants served by this unit?

## STEP THREE

### Conduct an Inspection of the Equipment

Overall appearance typically provides a pretty good indicator of the unit's actual condition and the quality of maintenance provided the unit. Inspect the equipment (or have a qualified technician perform the inspection), following the manufacturer's instructions and safety warnings before removing any access panels. Some of the things to check for:

- 1.** Is the cabinetry intact and fastened properly to minimize any air (or weather) leakage into or out of the unit?
- 2.** Are filters clean? Clogged or restricted filters reduce a system's efficiency markedly, increasing the internal negative air pressure and pulling dust, dirt, and debris into the unit's air circulating system.
- 3.** Are the coils in good condition? Look for evidence of dirt, debris, or physical damage to the coils. Bent, damaged, or restricted coils restrict air flow, reducing unit efficiency and increasing operating costs.
- 4.** For units with economizers: Does the economizer appear to be functioning? One sign of a problem is observing an outside air damper in a fully open position on a hot day.
- 5.** For units with fixed-position outside air dampers: Is the damper closed or nearly closed? Maintenance staff occasionally close an outside air damper if a unit is performing poorly and cannot satisfy the load on very hot or very cold days.

## STEP FOUR

### Prioritize Equipment for Replacement

After summarizing information from steps 2 and 3, assign a replacement priority level. For example, larger units may be higher priority because their replacement typically offers better payback due to economies of scale. Here are some suggested guidelines:

#### PRIORITY ONE

- Equipment over 25 years old
- Equipment over 20 years old in poor condition
- Equipment over 20 years old operating 24 hours per day

#### PRIORITY TWO

- Equipment over 20 years old in average condition with no economizer
- Equipment over 15 years old, no economizer, operating 24 hours per day

#### PRIORITY THREE

- Equipment over 20 years old in average condition

## STEP FIVE

### Develop a replacement schedule

Develop a schedule for equipment replacement that considers replacement priority and cost, and timing of other construction projects, like roof replacements. Replacement cost estimates can be provided by the inspection contractor. The schedule should be reviewed and revised every year.

## STEP SIX:

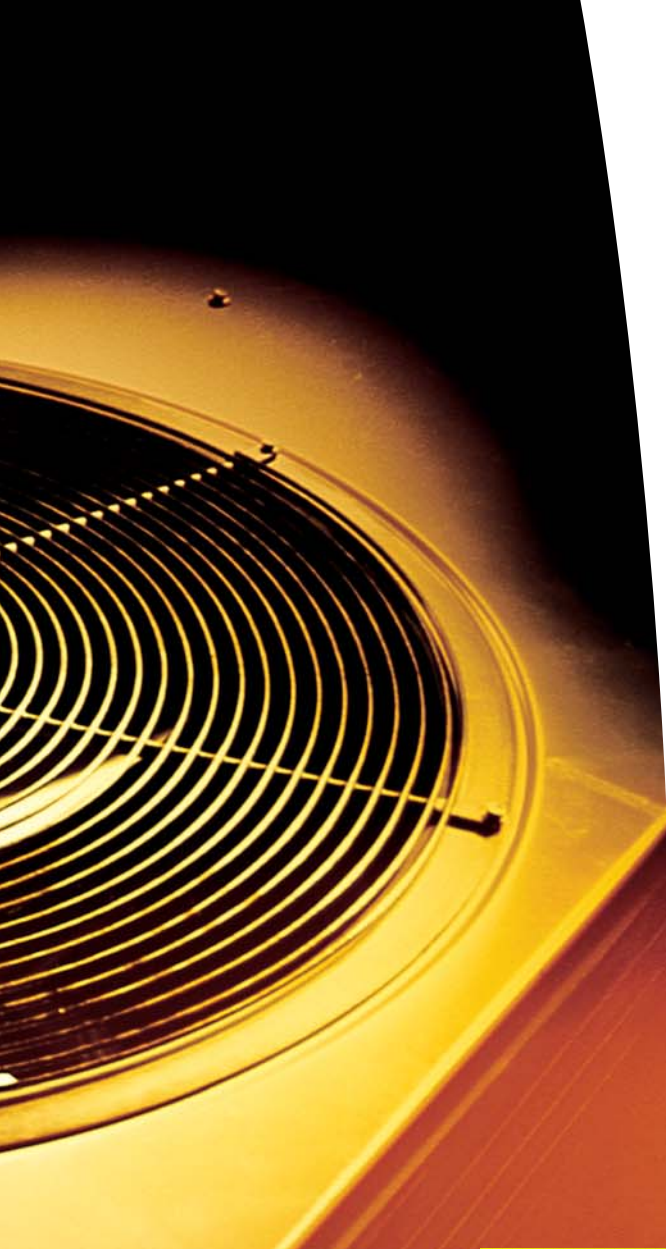
### Specify High Efficiency Replacement Units

When replacing HVAC equipment, specify high efficiency equipment. One easy way to specify high efficiency equipment is to use the Consortium for Energy Efficiency's (CEE) recommended minimum efficiencies found at [www.cee1.org/com/hecac/hecac-tiers.pdf](http://www.cee1.org/com/hecac/hecac-tiers.pdf). The Air-Conditioning and Refrigeration Institute (ARI) and the CEE have an online directory of energy-efficient central air conditioners and heat pumps at [www.cee1.org/com/hecac/Com\\_HVAC\\_spec.pdf](http://www.cee1.org/com/hecac/Com_HVAC_spec.pdf). We also recommend following the CEE guidelines for energy-efficient installations of HVAC equipment at [www.cee1.org/com/hecac/Com\\_HVAC\\_spec.pdf](http://www.cee1.org/com/hecac/Com_HVAC_spec.pdf).

Example City HVAC Inventory

Bldg	Unit	Area Served	Make/Model	Size	Year Installed	Functioning Economizer?	Maintenance Notes	Condition	Run Hrs/Day	Replacement Priority	Scheduled for Replacement
City Hall	C-1	Lobby	Carrier/60BA006320	5 ton	1995	No	Overhaul in 2000	Average	12	2	Spring 07
City Hall	C-2	Offices	Goodma/PH136A	7.5 ton	1992	No	Complaints common	Poor	24	1	Fall 06
Library	L-1	Offices	Day+Night585FPW048080ABEG	20 ton	2000	Yes	Warranty until 2005	Good	12	3	Fall 09

*Click here to download an inventory template.*



**Common HVAC terms defined:**

**Economizer:** During the cooling season, when outside air temperatures go below inside set point temperatures, it is usually appropriate to terminate the use of compressor-based cooling and open HVAC system dampers to supply 100% outside air. Economizers must be maintained and controlled with care to ensure that dampers are fully opened when needed—and fully shut when not.

**Energy-Efficiency Ratio (EER):** The ratio of the cooling capacity in Btus to the electric input to the air conditioner or heat pump in watt-hours.

**Variable air volume (VAV):** An HVAC system strategy through which the volume of air delivered to conditioned spaces is varied as a function of ventilating needs, energy needs, or both.

This fact sheet was produced by the ABAG Local Government Energy Partnership as a part of our efforts to help cities and government agencies save energy and money.

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